REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Added CAGE number 50507. Added device types 03 and 04, and case outline Y, (figure 2). Corrected table I gain error (GE).	91-01-25	W. Heckman
B	Changes in accordance with NOR 5962-R017-91.	91-10-07	G. A. Lude
C	Changes in accordance with NOR 5962-R157-92.	92-03-12	A. Barone
D	Changes in accordance with NOR 5962-R111-94.	94-02-04	K. A. Conttongim
E	Changes in accordance with NOR 5962-R127-94.	94-03-15	K. A. Conttongim
F	Changes in accordance with NOR 5962-R200-94.	94-05-31	K. A. Conttongim
G	Changes in accordance with NOR 5962-R201-95.	95-09-29	K. A. Conttongim
H	Correct case outline X package height dimension.	97-09-10	K. A. Conttongim
J	Table I, change maximum limits to LE and UOE tests.	98-01-22	K. A. Conttongim
K	Table I, Gain error, subgroups 5 and 6, change max limit from 0.24 %FSR to 0.35 %FSR. Table I, Digital input current high, change max limit from +40 µA to +80 µA. Update drawing boilerplate.	02-04-09	Raymond Monnin

REV																				
SHEET																				
REV																				
SHEET																				

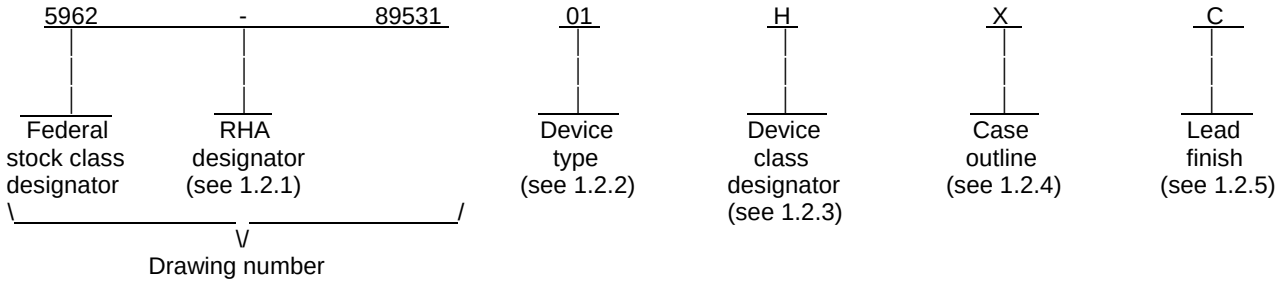
REV STATUS	REV	K	K	K	K	K	K	K	K	K	K	K	K		
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10	11	12		

PMIC N/A	PREPARED BY Donald R. Osborne	**DEFENSE SUPPLY CENTER COLUMBUS** **POST OFFICE BOX 3990** **COLUMBUS, OHIO 43216-5000** **http://www.dscc.dla.mil**
STANDARD MICROCIRCUIT DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A	CHECKED BY Robert M. Heber	
	APPROVED BY William K. Heckman	MICROCIRCUIT, HYBRID, LINEAR, 16-BIT, DIGITAL TO ANALOG CONVERTER
	DRAWING APPROVAL DATE 90-07-11	
	REVISION LEVEL K	SIZE A CAGE CODE **67268** **5962-89531** SHEET 1 OF 12

1. SCOPE

1.1 Scope. This drawing documents five product assurance classes as defined in paragraph 1.2.3 and MIL-PRF-38534. A choice of case outlines and lead finishes which are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of radiation hardness assurance levels are reflected in the PIN.

1.2 PIN. The PIN shall be as shown in the following example:



1.2.1 Radiation hardness assurance (RHA) designator. RHA marked devices shall meet the MIL-PRF-38534 specified RHA levels and shall be marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

1.2.2 Device type(s). The device type(s) identify the circuit function as follows:

Device type	Generic number	Circuit function
01	DAC-HPB	16-bit D/A converter; 0 to +10 V and ±5 V output
02	DAC-HPB-1, MN3292-VM	16-bit D/A converter; ±10 V output
03	MN3290-VM	16-bit D/A converter; 0 to +10 V output
04	MN3291-VM	16-bit D/A converter; ±5 V output

1.2.3 Device class designator. This device class designator shall be a single letter identifying the product assurance level. All levels are defined by the requirements of MIL-PRF-38534 and require QML Certification as well as qualification (Class H, K, and E) or QML Listing (Class G and D). The product assurance levels are as follows:

Device class	Device performance documentation
K	Highest reliability class available. This level is intended for use in space applications.
H	Standard military quality class level. This level is intended for use in applications where non-space high reliability devices are required.
G	Reduced testing version of the standard military quality class. This level uses the Class H screening and In-Process Inspections with a possible limited temperature range, manufacturer specified incoming flow, and the manufacturer guarantees (but may not test) periodic and conformance inspections (Group A, B, C, and D).
E	Designates devices which are based upon one of the other classes (K, H, or G) with exception(s) taken to the requirements of that class. These exception(s) must be specified in the device acquisition document; therefore the acquisition document should be reviewed to ensure that the exception(s) taken will not adversely affect system performance.
D	Manufacturer specified quality class. Quality level is defined by the manufacturers internal, QML certified flow. This product may have a limited temperature range.

1.2.4 Case outline(s). The case outline(s) are as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
X	See figure 1	24	Dual-in-line
Y	See figure 1	24	Dual-in-line

1.2.5 Lead finish. The lead finish shall be as specified in MIL-PRF-38534.

1.3 Absolute maximum ratings. 1/

Positive supply voltage (V_{CC})	-0.3 V dc to +18 V dc
Negative supply voltage (V_{EE})	+0.3 V dc to -18 V dc
Digital inputs (pins 1 through 16)	+5.5 V dc
Output current	±20 mA
Analog output voltage	±18 V (supply voltage)
Junction temperature (T_J)	+175°C
Storage temperature	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Power dissipation (P_D)	1.35 W
Thermal resistance:	
Junction-to-case (θ_{JC})	13°C/W
Junction-to-ambient (θ_{JA})	49°C/W

1.4 Recommended operating conditions.

Supply voltage ranges:	
Positive supply voltage (V_{CC})	+14.5 V dc to +15.5 V dc
Negative supply voltage (V_{EE})	-14.5 V dc to -15.5 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-38534 - Hybrid Microcircuits, General Specification for.

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-1835 - Interface Standard Electronic Component Case Outlines.

1/ Stresses above the absolute maximum ratings may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.

HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-103 - List of Standard Microcircuit Drawings.
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Unless otherwise indicated, copies of the specification, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Item requirements. The individual item performance requirements for device classes D, E, G, H, and K shall be in accordance with MIL-PRF-38534. Compliance with MIL-PRF-38534 may include the performance of all tests herein or as designated in the device manufacturer's Quality Management (QM) plan or as designated for the applicable device class. Therefore, the tests and inspections herein may not be performed for the applicable device class (see MIL-PRF-38534). Furthermore, the manufacturer may take exceptions or use alternate methods to the tests and inspections herein and not perform them. However, the performance requirements as defined in MIL-PRF-38534 shall be met for the applicable device class.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.4 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.2.3 Analog output data. The analog output data shall be as specified on figure 3.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are defined in table I.

3.5 Marking of device(s). Marking of device(s) shall be in accordance with MIL-PRF-38534. The device shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's vendor similar PIN may also be marked.

3.6 Data. In addition to the general performance requirements of MIL-PRF-38534, the manufacturer of the device described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, for each device type listed herein. Also, the data should include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DSCC-VA) upon request.

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance (original copy) submitted to DSCC-VA shall affirm that the manufacturer's product meets the performance requirements of MIL-PRF-38534 and herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Resolution	RES	Complementary binary	1, 2, 3	01, 03	16		Bits
Resolution	RES	Complementary offset binary	1, 2, 3	01, 02, 04	16		Bits
Linearity error	LE	Major sums, carries	4	All		0.0038	%FSR
			5, 6			0.012	
Differential linearity error	DLE	14-bit monotonic	4	All		0.006	%FSR
		13-bit monotonic	5, 6			0.024	
Gain error	GE	V_O = +FS, +10 V and ±10 V FSR	4	All		0.1	%FSR
			5, 6			0.35	
Unipolar offset error	UOE	V_O = 0 V to +10 V range	4	01, 03		0.15	%FSR
			5, 6			0.20	
Bipolar offset error	BOE	V_O = ±10 V range	4	02		0.1	%FSR
			5, 6			0.3	
		V_O = ±5 V range	4	01, 04		0.1	%FSR
			5, 6			0.3	
Reference error	V_{REF}	V_{REF} = 6.300 V ideally	4	All	6.23	6.37	V
			5, 6		6.2147	6.3826	
Reference current 2/	I_{REF}	For external use, 3/ T_A = +25°C	1	All	2		mA
Slew rate 2/	SR	10 V step, T_A = +25°C 3/	4	All	10		V/µs
Settling time 2/	t_s	10 V step to .003% FSR T_A = +25°C	9	All		20	µs
		1 LSB step to .003% FSR T_A = +25°C				15	
Bipolar output voltage, positive (full scale) 4/	$+V_{BO}$	±5 V range, T_A = +25°C	7	01, 04	+4.9999		V
		±10 V range, T_A = +25°C, Input = 0000 0000 0000 0000		02	+9.9999		

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Bipolar output voltage, negative (full scale) 4/	$-V_{BO}$	±5 V range, T_A = +25°C	7	01, 04	-5.0000		V
		±10 V range, T_A = +25°C, Input = 1111 1111 1111 1111		02	-10.0000		
Unipolar output voltage, positive (full scale) 4/	$+V_{UO}$	±10 V range, T_A = +25°C, Input = 0000 0000 0000 0000	7	01, 03	+9.9999		V
Unipolar output voltage, negative (full scale) 4/	$-V_{UO}$	0 to +10 V FSR, T_A = +25°C, Input = 1111 1111 1111 1111	7	01, 03	0.0000		V
Output current	I_O	V_O = ±10 V	4, 5, 6	All		±5	mA
Power supply rejection ratio	PSRR	Worst case, V_S = ±0.5 V	4, 5, 6	All		0.006	%FSR/ %VS
Supply currents	I_{CC}	V_{CC} = +15.5 V	1, 2, 3	All		+33	mA
	I_{EE}	V_{EE} = -15.5 V				-38	
Power dissipation	P_D	V_S = ±15.5 V	1, 2, 3	All		1100	mW
Digital input voltage high	V_{IH}	I_{IH} = +40 µA	1, 2, 3	All	2.7		V
Digital input voltage low	V_{IL}	I_{IL} = -0.5 mA	1, 2, 3	All		0.8	V
Digital input current high	I_{IH}	V_{IH} = +2.7 V	1, 2, 3	All		+80	µA
Digital input current low	I_{IL}	V_{IL} = +0.8 V	1, 2, 3	All		-1.6	mA

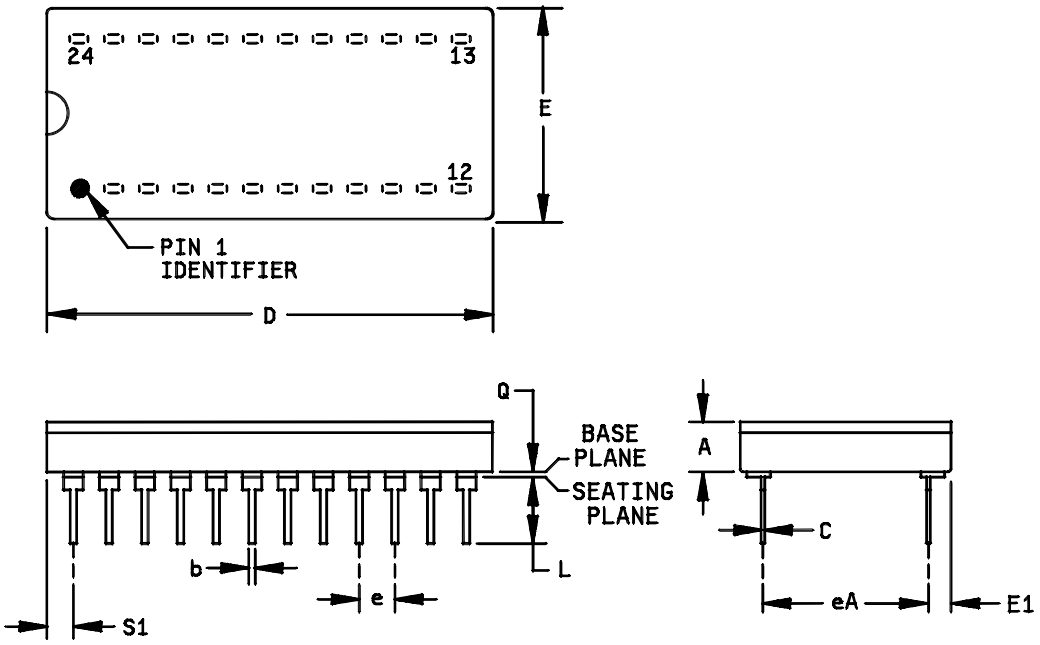
1/ Unless otherwise specified, the following conditions apply: V_{CC} = +15.0 V, V_{EE} = -15.0 V, logic "0" = +0.8 V dc, logic "1" = 2.4 V dc. Device types 01 and 03, FSR = 10 V with testing over 0 V to +10 V range. Device type 02, FSR = 20 V with testing over -10 V to +10 V range. Device types 01 and 04, FSR = 10 V with testing over -5 V to +5 V range. Devices tested with no load applied, using internal reference. Ambient temperature as simulated by a temperature forcing hood.

2/ Parameter shall be tested as part of device initial characterization and after design and process changes. Parameter shall be guaranteed to the limits specified in table I for all lot(s) not specifically tested.

3/ If more than 10 µA is drawn externally, the reference temperature coefficient will increase resulting in a proportional change in the gain and bipolar offset performance.

4/ See figure 3 listing of additional digital input codes to nominal analog outputs.

Case outline X.

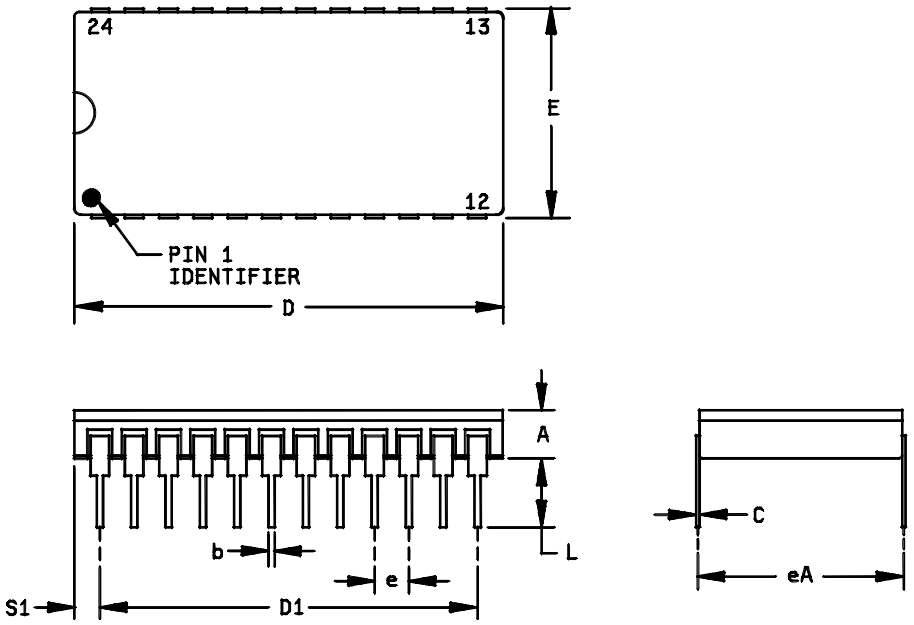


Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	----	4.83	----	0.190
b	----	0.46	----	0.018
C	----	0.25	----	0.010
D	----	33.27	----	1.310
E	----	20.32	----	0.800
E1/S1	----	2.54	----	0.100
e	----	2.54	----	0.100
eA	----	15.24	----	0.600
L	3.81		0.150	----
Q	0.61	0.66	0.024	0.026

NOTES:
1. The U.S. preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Pin numbers are for reference only.

FIGURE 1. Case outline(s).

Case outline Y.



Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	3.89	4.65	0.153	0.183
b	0.38	0.48	0.015	0.019
C	0.20	0.30	0.008	0.012
D	31.24	32.26	1.230	1.270
D1	27.81	28.07	1.095	1.105
E	15.62	15.87	0.615	0.625
e	2.49	2.59	0.098	0.102
eA	15.11	15.37	0.595	0.605
L	5.08	5.84	0.200	0.230
S1	1.65	2.03	0.065	0.080

NOTES:
1. The U.S. preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Pin numbers are for reference only.

FIGURE 1. Case outline(s) - Continued.

Device types	All		
Case outlines	(X, device types 01, 02) and (Y, device types 02, 03, 04)		
Terminal number	Terminal symbol	Terminal number	Terminal symbol
1	Bit 1 (MSB)	13	Bit 13
2	Bit 2	14	Bit 14
3	Bit 3	15	Bit 15
4	Bit 4	16	Bit 16 (LSB)
5	Bit 5	17	Output
6	Bit 6	18	Bipolar offset
7	Bit 7	19	V_{EE}
8	Bit 8	20	Ground
9	Bit 9	21	Sum junction
10	Bit 10	22	Gain adjust
11	Bit 11	23	V_{CC}
12	Bit 12	24	Reference output

FIGURE 2. Terminal connections.

Bipolar operation - complementary offset binary.

Digital input code	Scale	Analog output voltage range	
MSB LSB		Device types 01 and 04, ±5 V range	Device type 02, ±10 V range
0000 0000 0000 0000	+FS -1 LSB	+4.99985 V	+9.99969 V
0011 1111 1111 1111	+1/2 FS	+2.50000 V	+5.00000 V
0111 1111 1111 1111	0	0.00000 V	0.00000 V
1011 1111 1111 1111	-1/2 FS	-2.50000 V	-5.00000 V
1111 1111 1111 1110	-FS +1 LSB	-4.99985 V	-9.99969 V
1111 1111 1111 1111	-FS	-5.00000 V	-10.00000 V

Unipolar operation - complementary binary.

Digital input code	Scale	Analog output voltage range
MSB LSB		Device types 01 and 03, 0 to +10 V range
0000 0000 0000 0000	+FS -1 LSB	+9.99969 V
0011 1111 1111 1111	+3/4 FS	+7.50000 V
0111 1111 1111 1111	+1/2 FS	+5.00000 V
1011 1111 1111 1111	+1/4 FS	+2.50000 V
1111 1111 1111 1110	+1 LSB	+153 μV
1111 1111 1111 1111	0	0 V

FIGURE 3. Analog output data.

TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	1
Final electrical parameters	1*,2,3,4,5,6,7
Group A test requirements	1,2,3,4,5,6,7,9,**
Group C end-point electrical parameters	1
End-point electrical parameters for radiation hardness assurance (RHA) devices	Not applicable

* PDA applies to subgroup 1.
** Parameter shall be tested as part of device initial characterization and after design and process changes. Parameter shall be guaranteed to the limits specified in table I for all lot(s) not specifically tested.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38534. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Conformance and periodic inspections. Conformance inspection (CI) and periodic inspection (PI) shall be in accordance with MIL-PRF-38534 and as specified herein.

4.3.1 Group A inspection (CI). Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. Tests shall be as specified in table II herein.

b. Subgroups 8, 10, and 11 shall be omitted.

4.3.2 Group B inspection (PI). Group B inspection shall be in accordance with MIL-PRF-38534.

4.3.3 Group C inspection (PI). Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1005 of MIL-STD-883.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection (PI). Group D inspection shall be in accordance with MIL-PRF-38534.

4.3.5 Radiation Hardness Assurance (RHA) inspection. RHA inspection is not currently applicable to this drawing.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-PRF-38534.

6.4 Record of users. Military and industrial users shall inform Defense Supply Center Columbus when a system application requires configuration control and the applicable SMD. DSCC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DSCC-VA, telephone (614) 692-0544.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, Post Office Box 3990, Columbus, Ohio 43216-5000, or telephone (614) 692-0536.

6.6 Sources of supply. Sources of supply are listed in MIL-HDBK-103 and QML-38534. The vendors listed in MIL-HDBK-103 and QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DSCC-VA and have agreed to this drawing.

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 02-04-09

Approved sources of supply for SMD 5962-89531 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38534 during the next revisions. MIL-HDBK-103 and QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DSCC-VA. This bulletin is superseded by the next dated revisions of MIL-HDBK-103 and QML-38534.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-8953101HXC	50721	DAC-HPB/883
5962-8953102HXC	50721	DAC-HPB-1/883
5692-8953102HYA	3/	MN3292-VMYA
596208953102HYC	3/	MN3292-VMYC
5692-8953103HYA	3/	MN3290-VMYA
596208953103HYC	3/	MN3290-VMYC
5692-8953104HYA	3/	MN3291-VMYA
596208953104HYC	3/	MN3291-VMYC

1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the Vendor to determine its availability.
2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
3/ Not available from a QML source.

Vendor CAGE number	Vendor name and address
50721	Datel, Incorporated 11 Cabot Boulevard Mansfield, MA 02048-1151